2014

Annual IMPACT Report 2014: A report by the IMPACT Data Collection and Analysis Team, Part 3

IMPACT Management Team

IMPACT Assessment Team

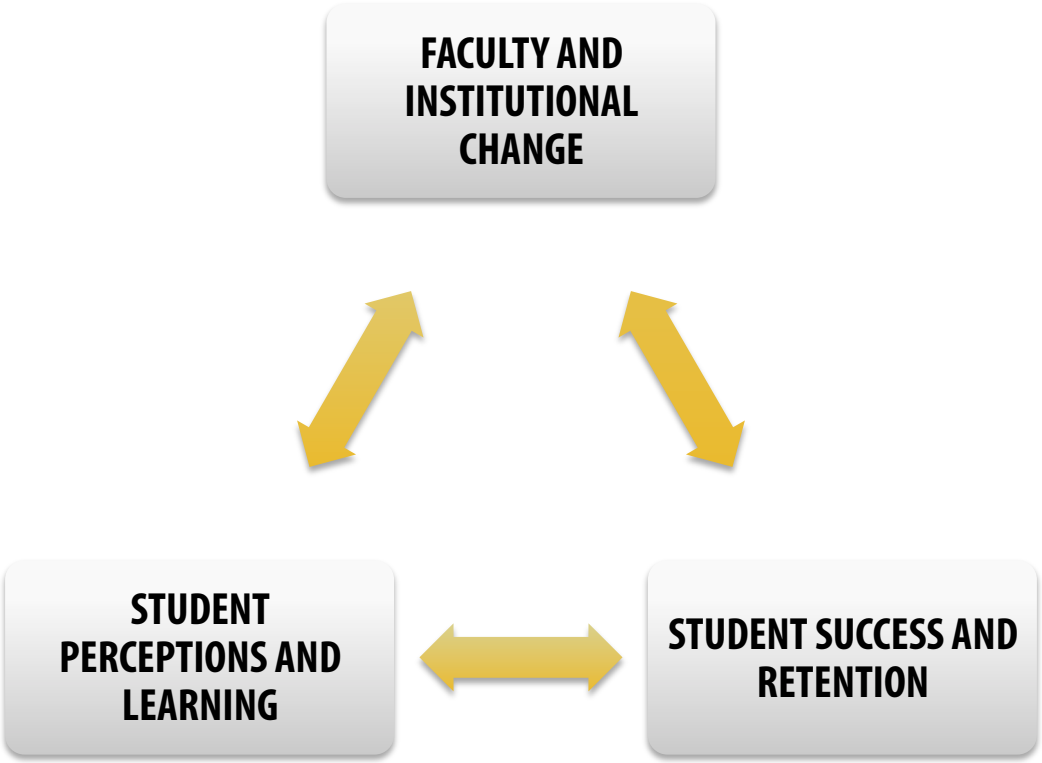
IMPACT
ANNUAL REPORT
2014

PURDUE
UNIVERSITY

iMPACT

RESULTS OF THE IMPACT PROGRAM

The purpose of this section is to provide a summary report on data collected, analyses conducted, and results obtained, since the beginning of the IMPACT program. The assessment of IMPACT falls into three different categories (see Figure 5 below):



Faculty and Institutional Change (led by the DLRC)
Student Perceptions and Learning (led by CIE)
Student Success and Retention (led by OIRAE)

Figure 5: Assessment goals for the IMPACT program

FACULTY AND INSTITUTIONAL CHANGE

This section summarizes faculty self-reported changes to teaching practices (regarding course planning, preparation and implementation) as a result of participation in the IMPACT program.

IMPACT fellows were surveyed and interviewed throughout their participation in the program. Faculty are asked about their perceptions of the faculty development activities, the impacts of participation on their teaching approaches, the benefits and challenges of participation and redesign implementation, and the catalysts and barriers to sustaining and transferring their new teaching practices. Survey data are tabulated and analyzed descriptively. Mean response rates to surveys are approximately 66%. Interview data are transcribed and analyzed for salient themes associated with the areas of interest. Results are discussed below by area of interest.

- Faculty reported impacts on teaching
- Faculty reported impacts on students
- Faculty reported barriers to sustainability

Faculty reported impacts on teaching

Surveys conducted with IMPACT participants at the end of the FLC process suggest that they gain knowledge about many aspects of teaching and learning during the Faculty Learning Community (FLC). Table 2 displays mean values of participant agreement with statements regarding the impact of the FLC on their knowledge and planned teaching approaches.

"To what extent do you agree or disagree with the following statements…"
(1 = "Strongly Disagree", 6 = "Strongly Agree")

QUESTION	N	MEAN	STD. DEVIATION
I gained useful ideas from the support team	67	5.46	.804
I plan to apply/use the lessons learned in my other class	66	5.44	.659
I had the opportunity to reflect more on my teaching and how to improve it	67	5.36	.773
I gained specific activities that I can incorporate into my course	67	5.28	1.042
I am enthusiastic about implementing my course redesign	67	5.28	.934
My participation in IMPACT will add value to the course I teach	67	5.22	.902
I was able to create clearer learning objectives for my course	66	5.21	.814
I enjoyed social interaction with colleagues at the workshop	67	5.19	.783

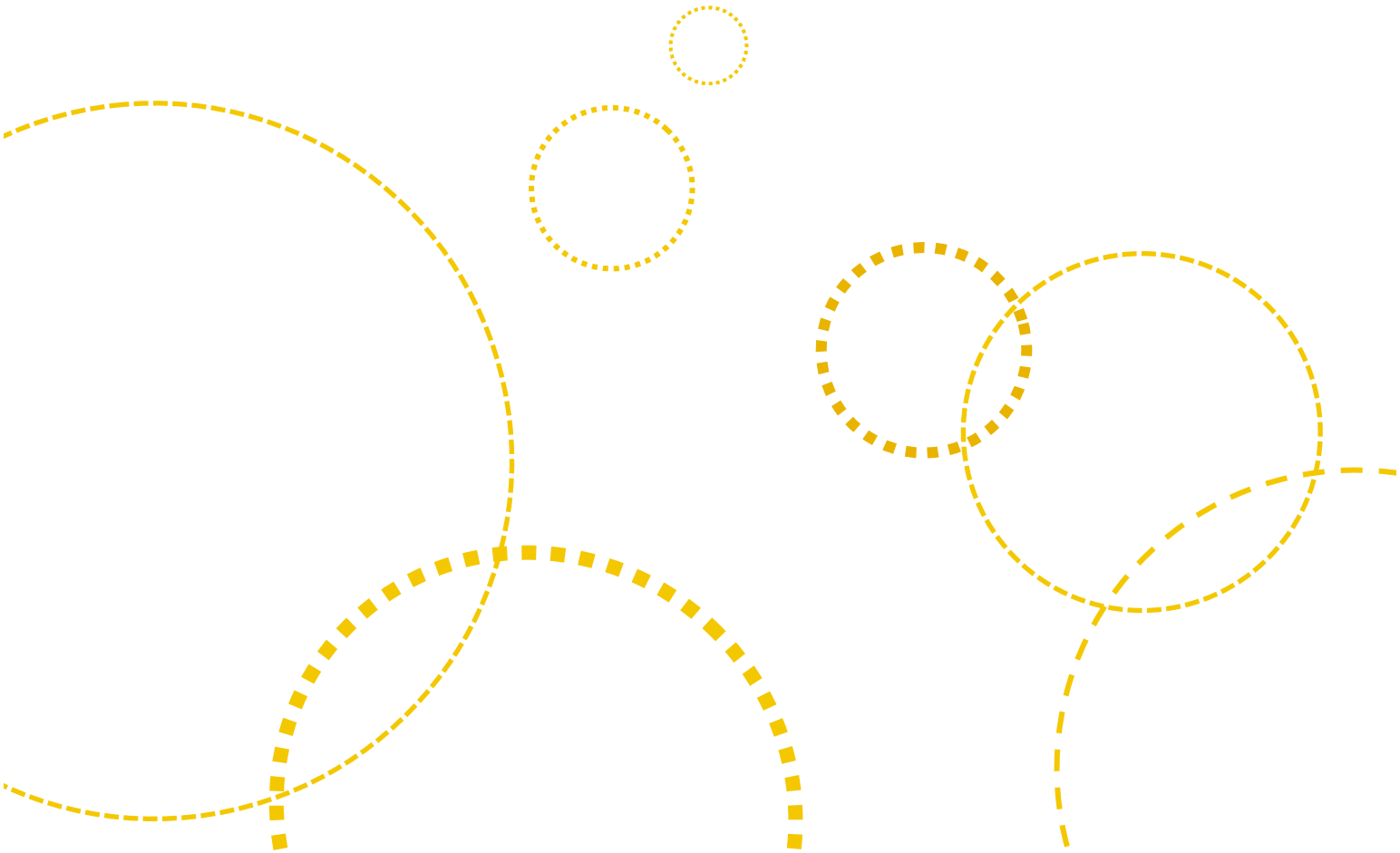
Table 2. Faculty perceptions of FLC impacts

Interviews conducted with faculty in multiple cohorts reveal that through participation in IMPACT they learn about a) how to use learning objectives to effectively plan a learner-centered course and b) specific, research-based teaching strategies that foster active learning in students. For example, comments regarding lessons learned included:

> *"I was ... learning a lot more about learning outcomes … That was for me the most useful part about class prep, or forming classes and so on."*

and

> *"Yeah I feel like I mean a more concrete way to learn about the pedagogy the science behind the teaching. I mean that it was helpful in that way."*



"...participation in IMPACT significantly improves instructor satisfaction with their teaching approaches, their ability to identify, and effortlessly implement appropriate instructional technology."

Longitudinal survey data collected from the Fall 2012 and Spring 2013 cohorts (N=16) reflect these changes in faculty use of learning objectives as tools for facilitating student centered teaching and assessment. At both entrance to the IMPACT program and after redesign implementation, participants are asked how they design the content and assessment of their course. After participating in IMPACT and implementing their first redesigned course, instructors are significantly more likely to report choosing assessment methods based on their alignment with the course learning objectives.

Longitudinal survey data also indicate that participation in IMPACT significantly improves instructor satisfaction with their teaching approaches, their ability to identify, and effortlessly implement appropriate instructional technology.

Faculty reported impacts on students

Longitudinal surveys collected from the Fall 2012 and Spring 2013 cohorts (N = 16) assesses faculty's perceptions of student use of key skills (e.g., critical thinking and good study habits) and engagement using several behavioral indicators both at the entrance to the IMPACT program and after implementing the redesigned course for the first time. Faculty report significantly positive changes in student engagement and use of key academic skills. For example, after participating in IMPACT and completing their first implementation of a redesigned course, faculty are more likely to agree that students were active participants and engaged in the course. They are more likely to agree that students demonstrate critical thinking skills and good study habits.

"...after participating in IMPACT and completing their first implementation of a redesigned course, faculty are more likely to agree that students were active participants and engaged in the course."

Faculty reported barriers to sustainability

"The most commonly cited barriers are the lack of a common culture of teaching and learning among faculty, administrators and students."

Promoting sustainability is one key goal of the IMPACT program. To examine perceived barriers to sustainability, IMPACT fellows are surveyed and interviewed periodically beginning with their entrance to the program and continuing yearly after they have first implemented their redesign. Descriptive and thematic analysis of qualitative data collected after faculty have implemented their first redesigned course reveal that faculty and instructors encounter barriers on several levels. Those barriers include cultural and structural disconnects, as well as, resource availability.

The most commonly cited barriers are the lack of a common culture of teaching and learning among faculty, administrators and students. IMPACT fellows describe encountering resistance at all levels—students, colleagues and unit administrators. However, the magnitude and breadth of resistance varies across campus units.

Students, in particular, were often resistant. Their expectations for college teaching and learning were at odds with the redesigned course.

> ***"What didn't work well was that too many of the students just weren't listening and participating, and I think the reason for that is that a lot of freshmen tend to be oriented towards 'what piece of information do I have to repeat for the exam'…'what's the one little piece of information with meaning that you want me to repeat' and it's very hard to get them out of that [way of thinking about teaching and learning]."***

Faculty often mentioned needing to "sell" the redesign or "convince" colleagues in their unit that redesigning their course to make it more active and student-centered was a good idea. Those who were unsure about the support of their unit colleagues and administrators felt that they were taking a risk by participating in IMPACT.

> ***"I wish I knew how to tell that story better, I think when I tell that story some of my colleagues are feeling threatened and it shouldn't be threatening…I wish I knew that my department valued this…I wish I knew how to measure and convince my department of the value of this…"***

Some IMPACT fellows were unsure if their unit supported their efforts and others lamented that without a larger coordination within and across units they were unsure if their redesigned course would make much difference.

Structural barriers described by participants included issues varying from complex course registration designations to institutional promotion processes and faculty appointments that do not incentivize innovative teaching. Lack of incentives for innovative teaching was the most commonly cited structural barrier. IMPACT fellows pointed out that the university promotion process does not weight their teaching heavily, so there is some disincentive to allocate their already stretched time to changing their course—especially if their appointment is primarily devoted to research. For example, one faculty participant described his experience:

> ***"In terms of my career advancement at Purdue this was actually a task and not an advantage…having a majority research appointment doesn't mean you don't care about teaching but it does mean that time is the critical bit and so dealing with people's time efficiently is really important."***

Additionally, when teaching is included for consideration in the promotion and tenure process, it is often student evaluations, not pedagogical innovation, that is considered. As such, student resistance to new forms of teaching may be a disincentive to sustaining or transferring redesign practices.

"Participants described a shortage of physical classroom spaces that met their needs and a shortage of teaching assistants who were prepared to aid in the implementation of the redesigned course."

The final barrier discussed by faculty was a lack of physical and human resources for implementing redesigned courses. Participants described a shortage of physical classroom spaces that met their needs and a shortage of teaching assistants who were prepared to aid in the implementation of the redesigned course. Current active learning spaces, while increasing in number, are still few and often not able to accommodate science demonstrations. Because many of the redesigned courses are large, foundational courses, faculty are relying on teaching assistants to play a larger role during what was previously lecture time and is now filled with activities and discussions mediated by instructors and teaching assistants. Teaching assistants need additional training to develop the skills to manage and facilitate learning in this context. Some instructors have experienced teaching assistants available, but many others—typically in courses where the teaching assistants were previously serving as graders--require access to high quality training for their teaching assistants.

" Instructors appreciate the opportunity to talk about teaching with their peers and gain ideas from a wide range of disciplines."

In sum, through the IMPACT Faculty Learning Community (FLC) and interactions with associated support teams, instructors are gaining practical, useful, research-based active-learning pedagogical techniques that they are incorporating into their IMPACT redesigned course and other courses that they teach. The FLC process gives instructors the opportunity to reflect upon their teaching practice and improves instructor satisfaction with their teaching. Instructors appreciate the opportunity to talk about teaching with their peers and gain ideas from a wide range of disciplines. Instructors perceive IMPACT as significantly effecting student engagement and critical thinking skills. Overall, faculty are seeing positive outcomes and successfully implementing their redesigns. Faculty have identified several key barriers to sustainability of their new pedagogical approaches, such as: cultural expectations of teaching and learning processes and roles among students and faculty; lack of institutional incentives for faculty practicing innovative teaching; lack of resources to support new pedagogies. These barriers are not universal to all instructors and all units, but faculty felt that, where they were present, they posed a challenge to the sustainability of the outcomes generated by IMPACT.

STUDENT PERCEPTIONS AND LEARNING

The results reported in this section were collected in Fall 2013 and Spring 2014 on all IMPACT courses taught during that period with the use of a student survey. The survey was administered to students at the end of the semester to capture their perceptions of the classroom environment and their learning gains. A copy of the survey can be obtained upon request. The questions of interest are grouped into the following constructs.

> *Learning Climate (6 items), Autonomy (7 items), Competence (6 items), Relatedness (8 items), Perceived Knowledge Transfer (8 items), Learning Gains (8 items), Self-determined Motivation (18 items).*

The first part of this section will present relationships between the student perceptions listed above and will be based in data obtained in Spring 2014 only. The second part of this section will present comparisons between courses categorized based on the extent to which the learning environment was determined to be student-centered, and will be based on data obtained in Fall 2013 and Spring 2014.

Student-centered courses were categorized in the following way: Only courses with at least 15 responses to the post-survey and a response rate of at least 25% (acceptable response rate for survey research), were considered. A course was considered "high" student-centered if at least 75% of the student responses rated the learning environment as student-centered (above the scale mid-point on the learning climate scale). All other courses were considered "lower" student-centered. Based on this categorization, about 70% of the IMPACT courses that met the response rate inclusion criteria were categorized as "high" student-centered (N = 5433 enrollments).

"... about 70% of the IMPACT courses were categorized as "high" student-centered.

Relationships between Student Perceptions

The relevant demographics are presented in Table 3. The correlations presented in this section are based on the post-survey data (N = 4641).

	All Students (N = 12193)	Post-Survey Students (N = 4641)
Gender	41% female, 57% male	50% female, 50% male
Age	Age ranged from 16 to 55 (M = 19.97, SD = 2.25)	Age ranged from 16 to 55 (M = 20.17, SD = 2.60)
Ethnicity	64% White, 18% International, 5% Asian, 3% Black/African-American, 4% Latino/Hispanic	67% White, 19% International, 4% Asian, 3% Black/African-American, 4% Latino/Hispanic
Underrepresented Minority	8.8% underrepresented minority	7.5% underrepresented minority
Class Level	26% freshmen, 33% sophomores, 23% juniors, 18% seniors	22% freshmen, 32% sophomores, 27% juniors, 19% seniors
Overall GPA	GPA ranged from 0 to 4.0 (M = 3.00, SD = 0.61)	GPA ranged from 0 to 4.0 (M = 3.13, SD = 0.56)
IMPACT Course Grade	Course grade ranged from 0 to 4.0 (M = 2.99, SD = 1.06)	Course grade ranged from 0 to 4.0 (M = 3.25, SD = 0.91)

Table 3. Demographics for Spring 2014 data

As seen in Table 4, relationships between constructs follow predictions of Self-Determination Theory (Deci & Ryan, 1985, 2000), which is the theoretical framework used to guide the IMPACT redesigns (consult Part I of the Annual Report for details on the theoretical model). All correlations were statistically significant. A student-centered learning climate is significantly associated with greater perceptions of autonomy, competence, and connectedness, as well as higher levels of self-regulation (self-determined motivation). In addition, when students perceive the learning environment to be student-centered, they also report greater knowledge transfer, learning gains, and greater performance in the course.

" . . . when students perceive the learning environment to be student-centered, they also report greater knowledge transfer, learning gains, and perform better in the course."

	Learning Climate
Autonomy	.66
Competence	.58
Connectedness	.49
Self-Determined Motivation	.50
Knowledge Transfer	.55
Learning Gains	.51
Course Grade	.20

Table 4. Correlations between Learning Climate, Student Perceptions, and Course Grade in Spring 2014

Does Redesign Type Make a Difference?

> **"The overarching goal of IMPACT is to achieve student-centered learning environments through a variety of active learning pedagogies.**

When it comes to creating a student-centered learning environment, our findings suggest that "how" the redesign is delivered is more important that the type of redesign used. Results indicate that both the supplemental and replacement model can foster equivalent level of student-centered learning (See Figure 6). More data are needed for online courses in order to substantiate that conclusion. When differences exist, the replacement/flipped model tends to outperform the other models.

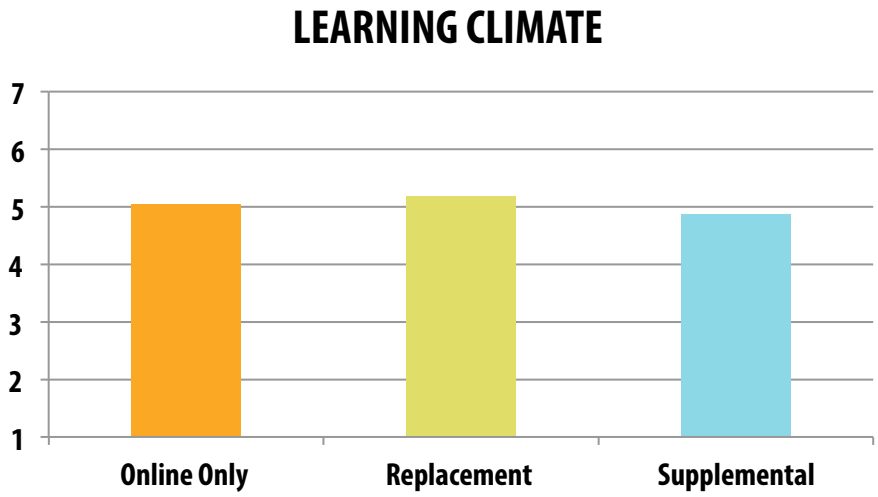


Figure 6. Learning climate by redesign type in Spring 2014. (Online only, N = 332; Replacement, N = 1319; Supplemental, N = 2646)

In sum, regardless of the redesign model used, students in the courses which produce higher level of student-centered learning tend to feel more competent and believe they can transfer their knowledge more easily to other academic areas. In addition, these students tend to earn higher course grades, provide more positive evaluations of their learning, the course, and the instructor when compared to students in courses associated with lower level of student-centered learning.

Effects of Student-Centered Learning | Comparisons between courses categorized based on the extent to which the learning environment was determined to be student-centered

The relevant demographics for this section are presented in Table 5. The following findings are based on data collected with the post-survey, in Fall 2013 and Spring 2014, and represent a total of 159 course sections.

	All Students (N = 19148)	Post-Survey Students (N = 7679)
Gender	42% female, 57% male	50% female, 50% male
Age	Age ranged from 15 to 56 (*M* = 19.87, *SD* = 2.26)	Age ranged from 15 to 56 (*M* = 20.04, *SD* = 2.60)
Ethnicity	66% White, 17% International, 5% Asian, 3% Black/African-American, 4% Latino/Hispanic	68% White, 18% International, 4% Asian, 2% Black/African-American, 4% Latino/Hispanic
Underrepresented Minority	8.4% underrepresented minority	7.3% underrepresented minority
Class Level	29% freshmen, 34% sophomores, 22% juniors, 16% seniors	26% freshmen, 32% sophomores, 25% juniors, 17% seniors
IMPACT Course Grade	Course grade ranged from 0 to 4.0 (*M* = 3.05, *SD* = 1.03)	Course grade ranged from 0 to 4.0 (*M* = 3.27, *SD* = 0.88)

Table 5. Demographics for Fall 2013 and Spring 2014 data

Students in IMPACT courses which were associated with a high level of student-centered learning reported significantly greater levels of perceived competence (see Figure 7) as well as significantly greater learning gains on faculty identified learning outcomes (see Figure 8).

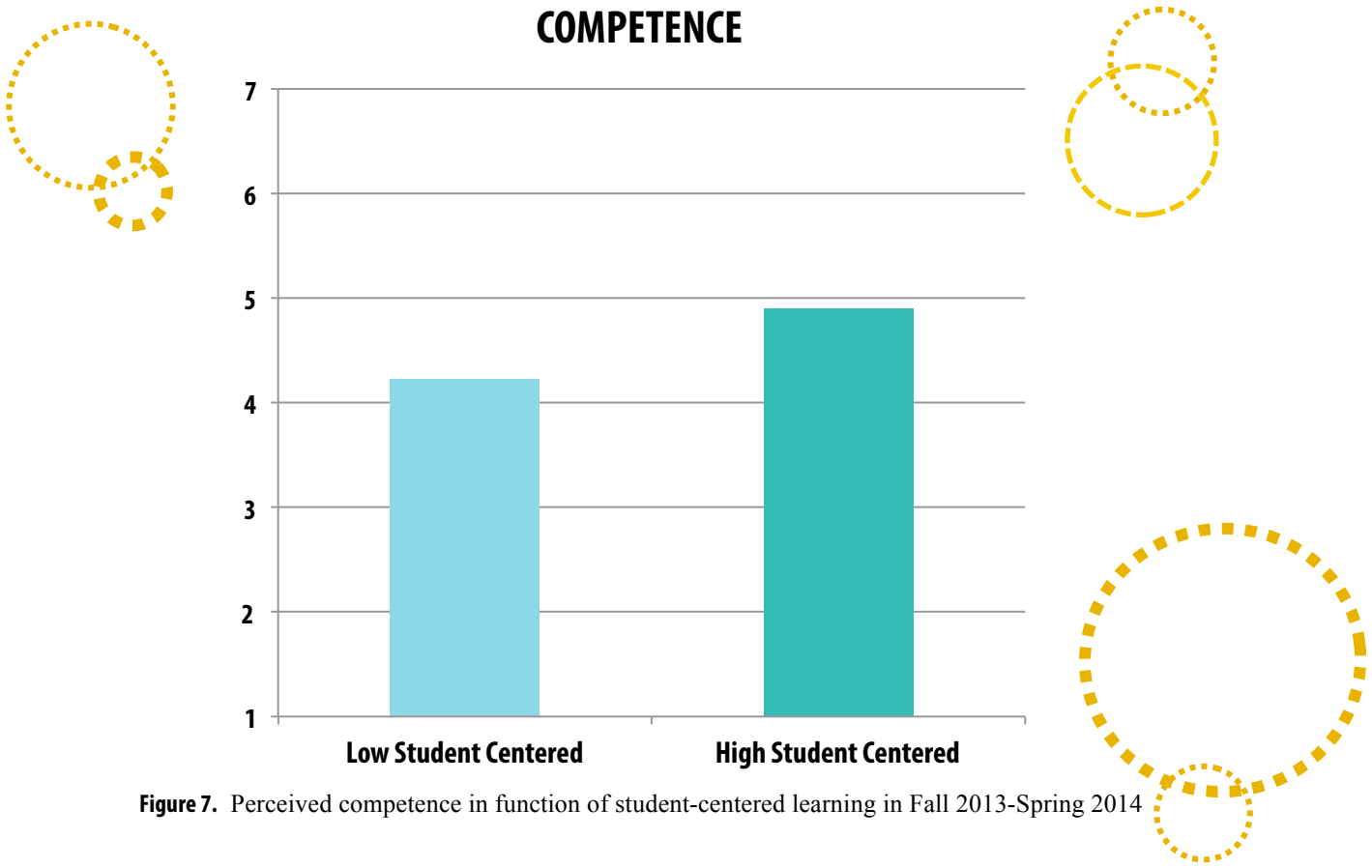


Figure 7. Perceived competence in function of student-centered learning in Fall 2013-Spring 2014

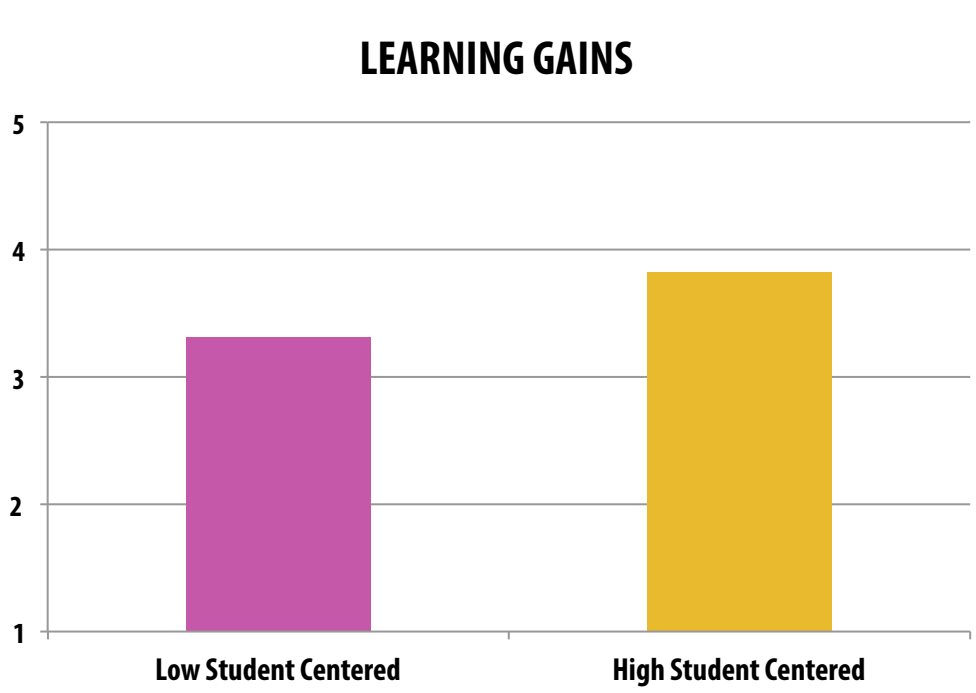


Figure 8. Perceived learning gains in function of student-centered learning in Fall 2013-Spring 2014

These students also reported that they would be able to transfer knowledge obtained in the IMPACT course to other relevant academic areas or life in general (see Figure 9).

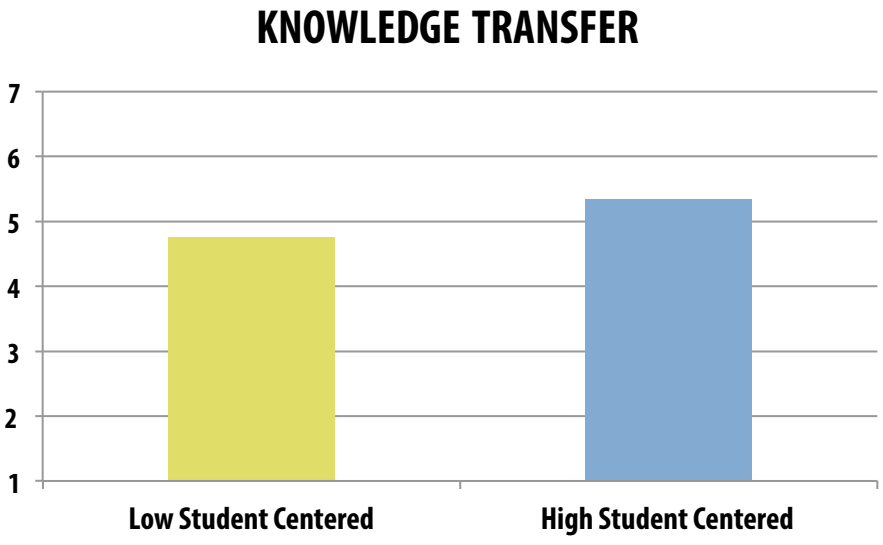


Figure 9. Knowledge transfer in function of student-centered learning in Fall 2013-Spring 2014

Students in high student-centered courses also rated the course as well as the instructor significantly more positively than students in lower student-centered courses (See Figure 10).

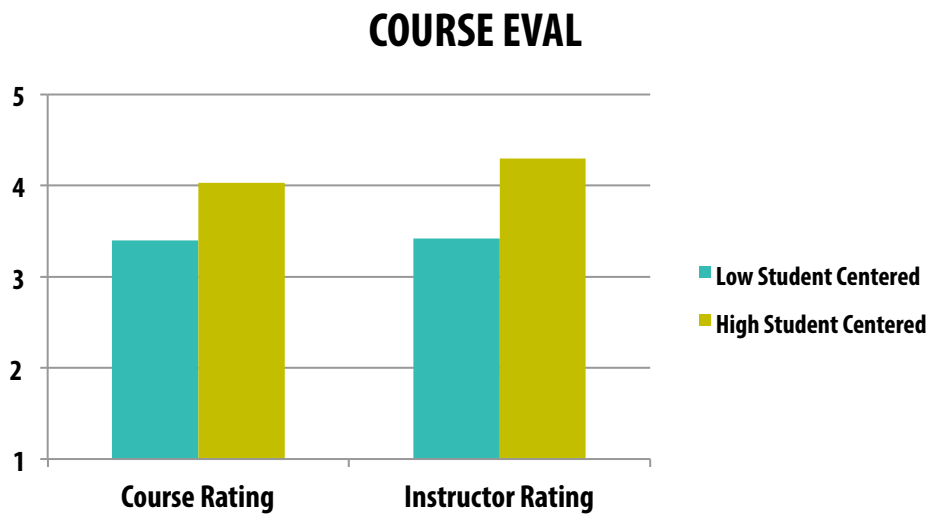


Figure 10. Course evaluations in function of student-centered learning in Fall 2013-2014

All the significant effects reported above, were associated with moderate to large effect sizes.

In sum, our analyses of the IMPACT program thus far support the notion that non-academic factors, such as the extent to which the environment is student-centered, are associated with a variety of student perceptions and improved student performance.

> “Taking into consideration a student-centered learning environment is extremely important in interpreting the data and the effectiveness of the redesigns conducted through IMPACT.

STUDENT SUCCESS AND RETENTION

Comparison between IMPACT and corresponding Non-IMPACT courses on DFW rates and course GPA

Aggregate analysis across all IMPACT courses is made difficult by the fact that the IMPACT program has dramatically changed since its inception in 2011. As IMPACT faculty and staff learned more about the conditions and redesign elements, which fostered a student-centered learning environment, corresponding changes were made to the Faculty Learning Community and redesign process. The scope of the program and course targets have similarly changed since the beginning of the program. Therefore, analyses were conducted at the cohort level to examine differences in DFW rates and course GPA. Differences will be highlighted in the presentation of the findings below.

FALL 2011 COHORT

DFW rates

For courses included in the Fall 2011 cohort, a significant decrease in DFW rates was observed. It is important to note here that in the first IMPACT cohort, courses with high DFW rates had been intentionally targeted and selected to be part of the first cohort (see Figure 11).

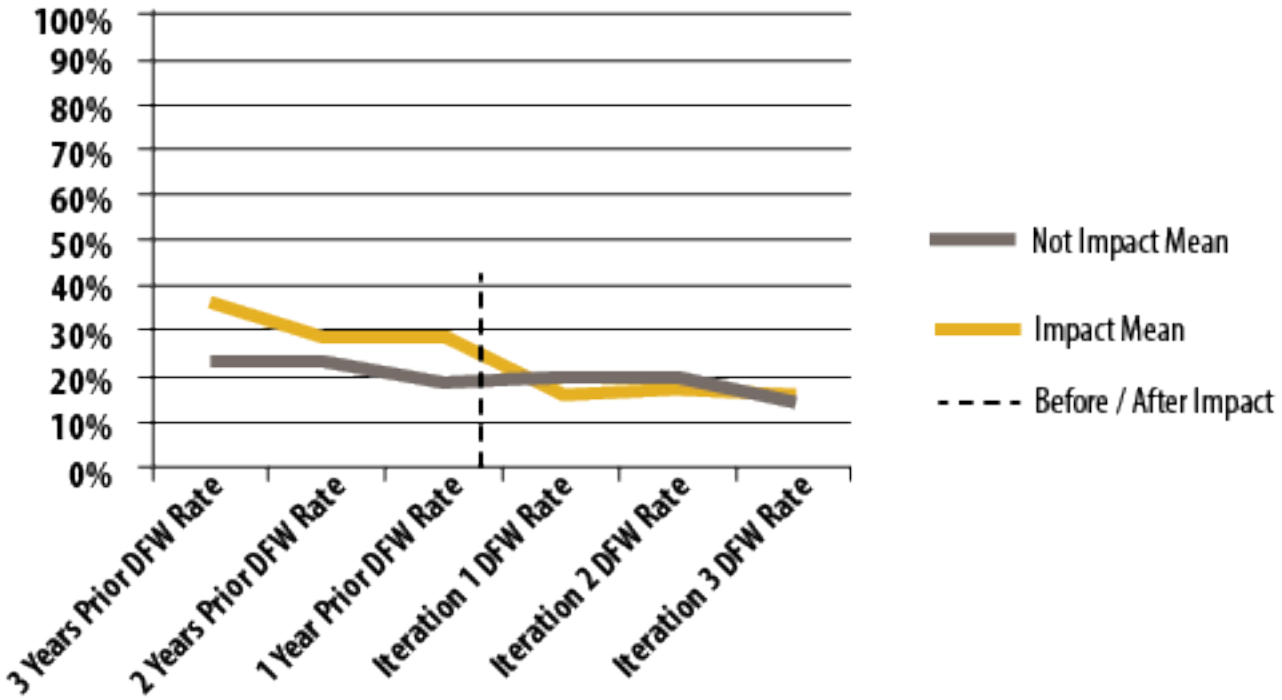


Figure 11. DFW Rate for IMPACT/Non-IMPACT courses by year for the Fall 2011 Cohort

Course GPA

Student performance in IMPACT courses was significantly lower three years prior to implementation of IMPACT redesigns and marginally lower a year before the implementation of the redesigns. Overall, the trend for student performance was lower in IMPACT courses compared to Non-IMPACT courses before the redesign (see Figure 12). After the initial redesign iteration, a significant jump in course GPA was observed for students in IMPACT courses, resulting in a significant difference between IMPACT courses and Non-IMPACT courses. In year two and three post-implementation, these differences leveled off.

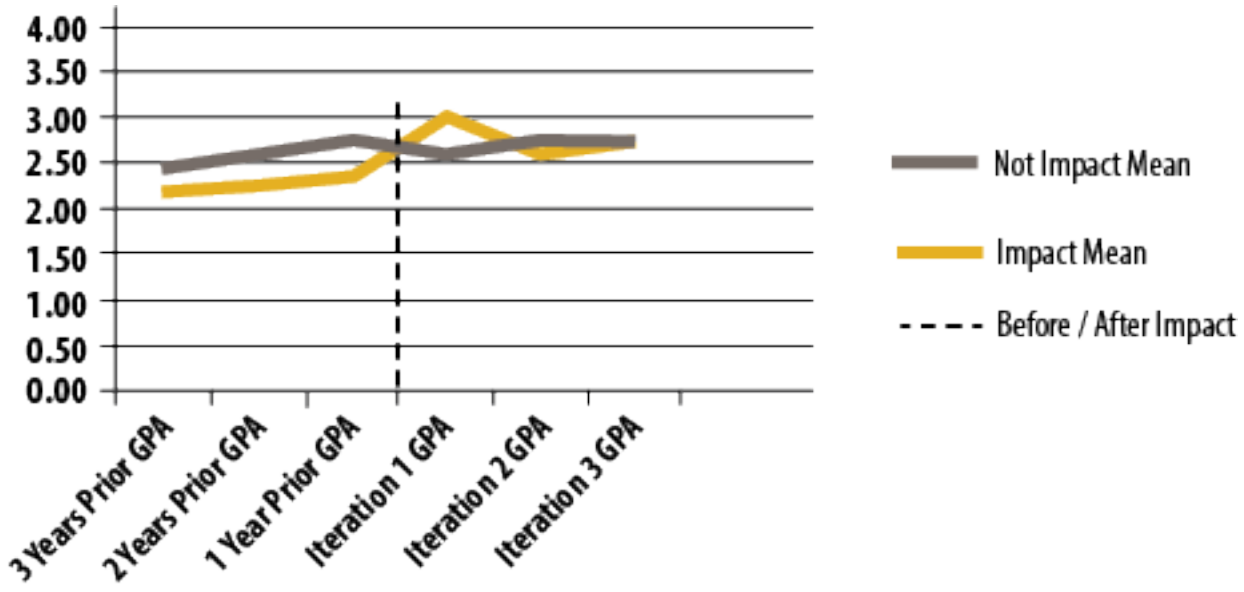


Figure 12. GPA for IMPACT/Non-IMPACT courses by year for the Fall 2011 Cohort

It is important to pause here in order to note that the relationship between DFW rates and course GPA is not a linear one and that factors which positively affect DFW rates will not necessarily also contribute to an increase in course GPA. As DFW rates decrease, a lower proportion of students fail or withdraw from the courses. Consequently, more students who are likely to pass the course or perform at course average would be kept in the "course pool". This situation would not necessarily lead to an increase in course GPA, although it would definitely benefit the students since a greater proportion of them would not need to retake the course, would continue progress through degree requirements, and would graduate on time.

> "As DFW rates decrease, a lower proportion of students fail or withdraw from the courses.

SPRING 2012 COHORT

DFW rates and Course GPA

For courses included in the Spring 2012 cohort, no differences were observed between IMPACT and Non-IMPACT courses for either DFW rates or course GPA. Despite the consistently low DFW rate, of some importance and possibly significance, is the beginning of a downward trend observed for DFW rates in IMPACT courses, which almost reached marginal significance two years after the implementation of the redesigns (see Figure 13). The GPA graph is presented in Figure 14.

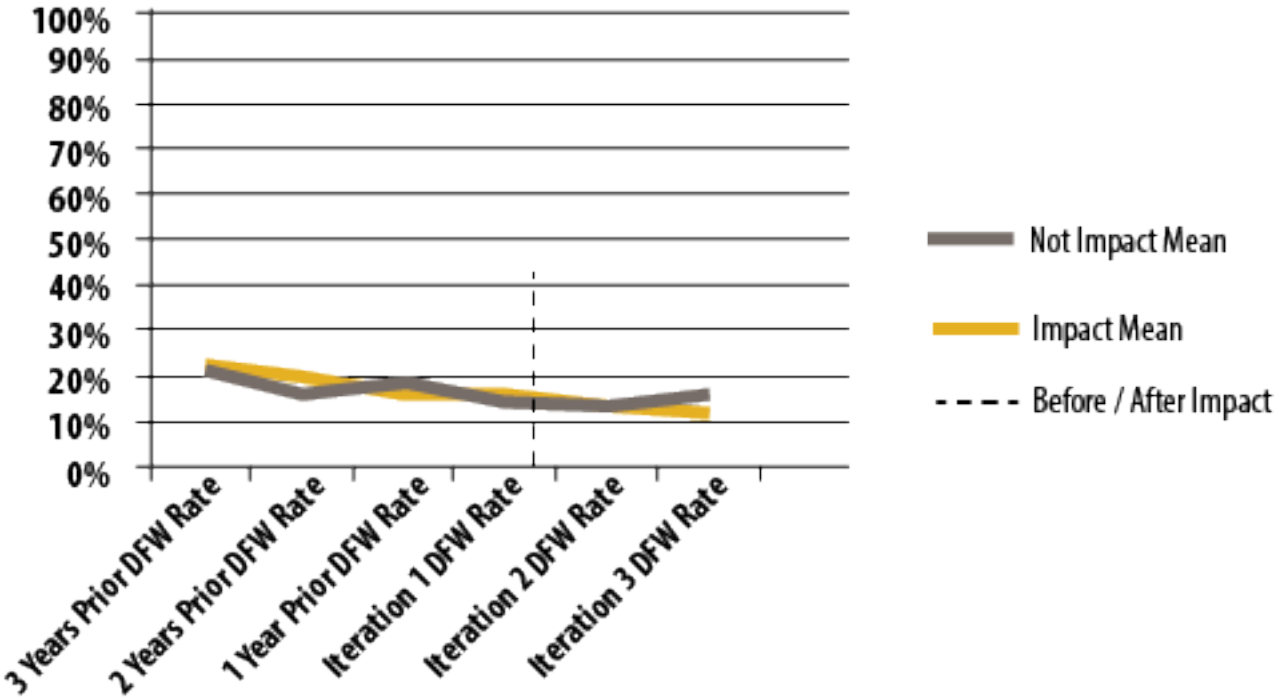


Figure 13. DFW rate for IMPACT/Non-IMPACT courses by year for the Spring 2012 Cohort

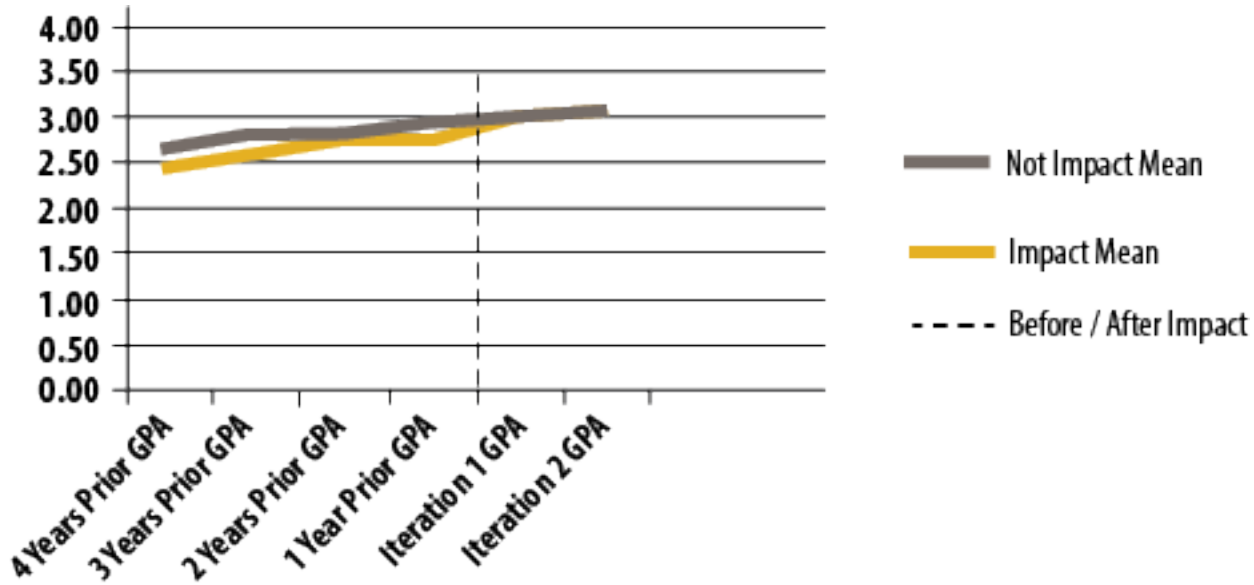


Figure 14. GPA for IMPACT/Non-IMPACT courses by year for the Spring 2012 Cohort

The courses selected to be part of the Spring 2012 cohort historically had not exhibited DFW rates in excess of 20%. In addition, we have noted that in many cases, several iterations of a redesigned course are required to achieve the full effect of the redesigns. Faculty take time to become accustomed to new pedagogies and work to incorporate those new ways of teaching into their existing course structure. It remains to be seen if this downward trend will continue as faculty fellows from the Spring 2012 cohort continue to iterate their course redesign.

"Faculty have to take time to get used to new pedagogies and work to effectively incorporate those new ways of teaching into their course. "

FALL 2012 COHORT

DFW rates and Course GPA

Differences between IMPACT and Non-IMPACT courses were not observed for the Fall 2012 cohort, for either DFW rates or course GPA. Courses that were included in the Fall 2012 cohort already had markedly low DFW rates, with an average around 12%. Therefore, a significant reduction in DFW rates was not expected (see Figure 15). The graph for GPA data is presented in Figure 16.

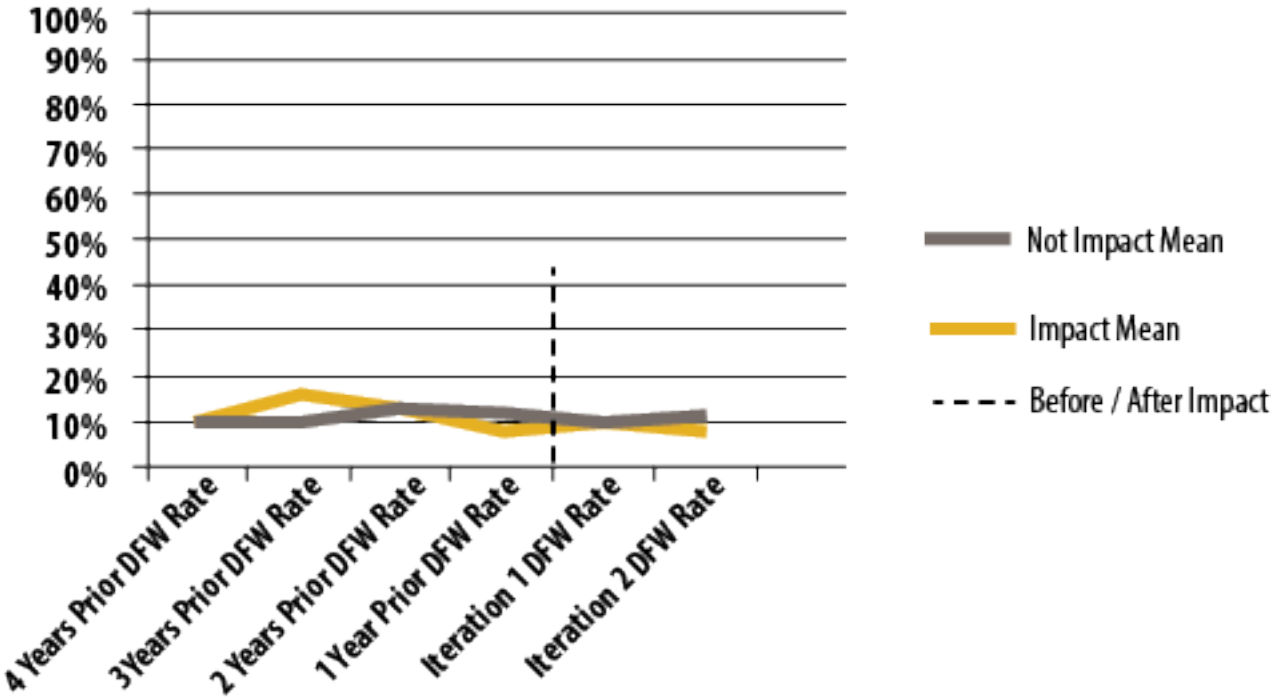


Figure 15. DFW Rates for IMPACT/Non-IMPACT courses by year for the Fall 2012 Cohort

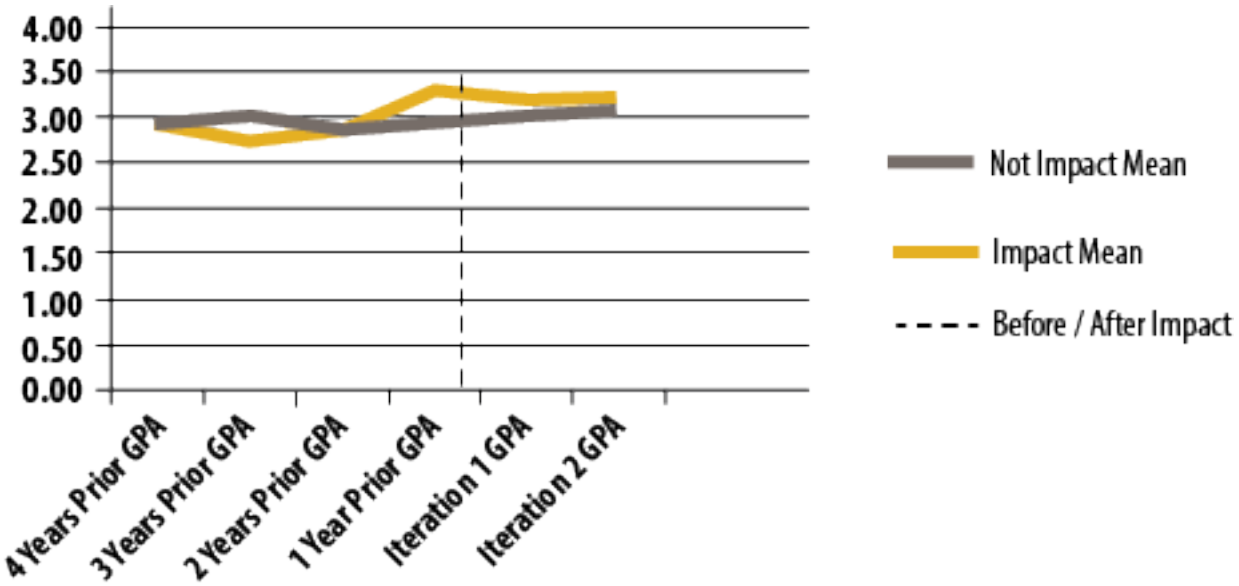


Figure 16. GPA for IMPACT/Non-IMPACT courses by year for the Fall 2012 Cohort

SPRING 2013 COHORT

DFW rates

A downward trend in DFW rates can be observed for courses included in Spring 2013 cohort (see Figure 17). The small sample size of Non-IMPACT courses complicates comparison of redesigned courses in the Spring 2013 cohort to control sections. Although differences in the number of course sections available for comparisons for the IMPACT and Non-IMPACT courses are common throughout the program period, for Spring 2013 cohort, only two Non-IMPACT sections were available for comparisons with the 50 IMPACT sections. This great difference in sample size may limit the generalizability of the findings and should be taken in consideration when examining results. In addition, only one year of data following the implementation of the redesigns is available for courses part of the Spring 2013 cohort. These results are preliminary.

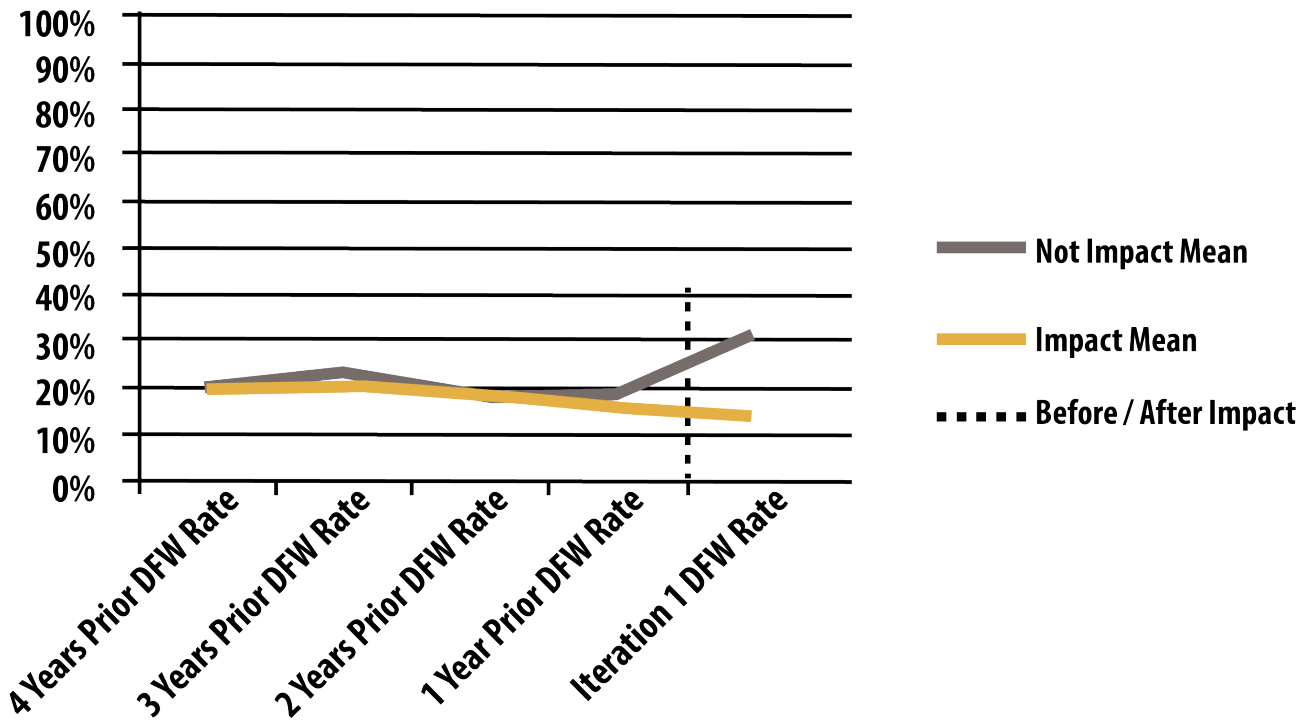


Figure 17. DFW rate for IMPACT/Non-IMPACT courses by year for the Spring 2013 Cohort

Course GPA

For courses included in the Spring 2013 cohort, student performance appears to remain relatively constant. More data are needed to establish a trend (see Figure 18).

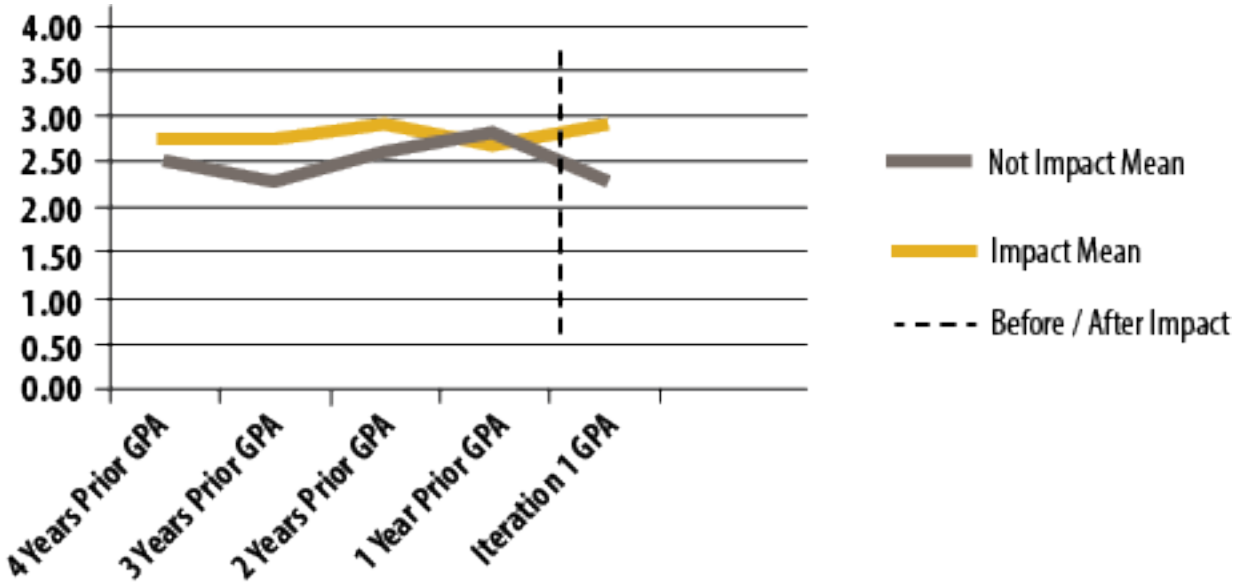


Figure 18. GPA for IMPACT/Non-IMPACT courses by year for the Spring 2013 Cohort

FALL 2013 COHORT

DFW rates and Course GPA

For courses included in the Fall 2013 Cohort there is a significant difference between the IMPACT and Not-IMPACT sections for all years for both GPA and DFW rates. Following the Purdue Moves initiative, in the Fall 2013, the IMPACT program began to target courses included in the newly approved Purdue core curriculum. As evidenced by the findings depicted in Figures 19 and 20, the core courses which became part of the Fall 2013 cohort were already exhibiting low DFW rates and high GPA. In all the comparisons, the IMPACT courses appeared significantly better than the corresponding non-IMPACT courses even before the implementation of the redesigns. More data from future iterations are needed in order to see how this trend will develop and whether the discrepancy between the IMPACT and Non-IMPACT courses will become more pronounced.

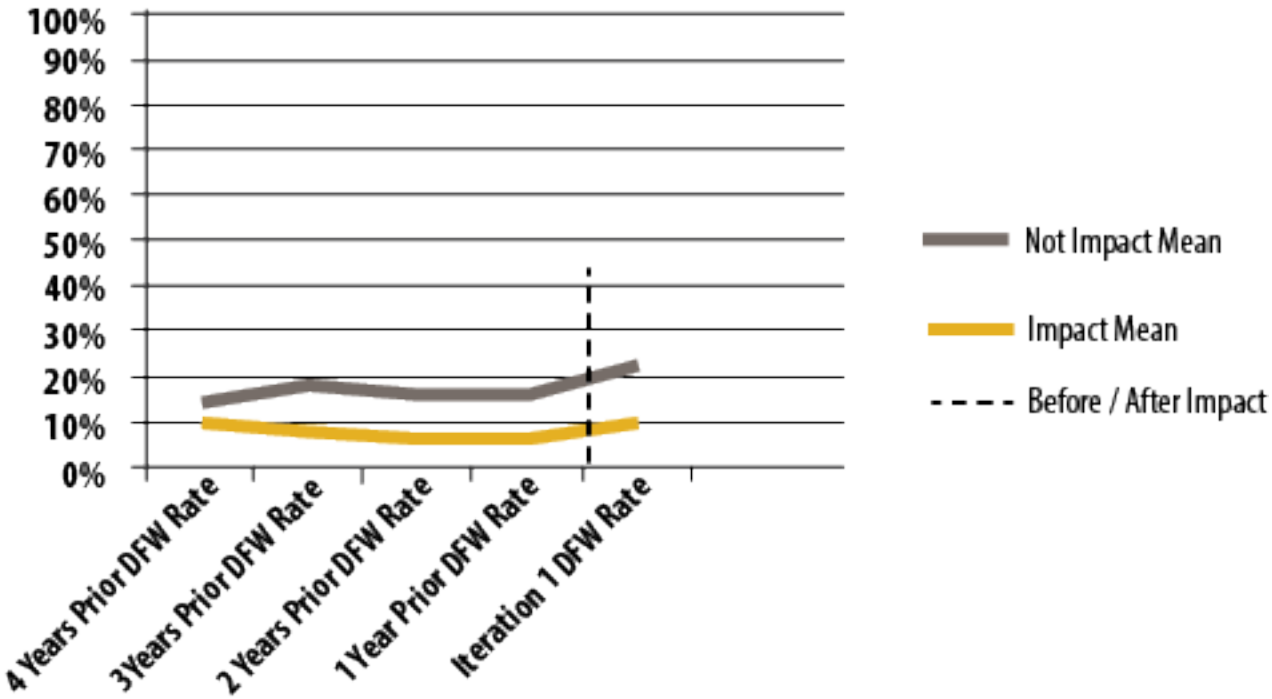


Figure 19. DFW rate for IMPACT/Non-IMPACT courses by year for the Fall 2013 Cohort

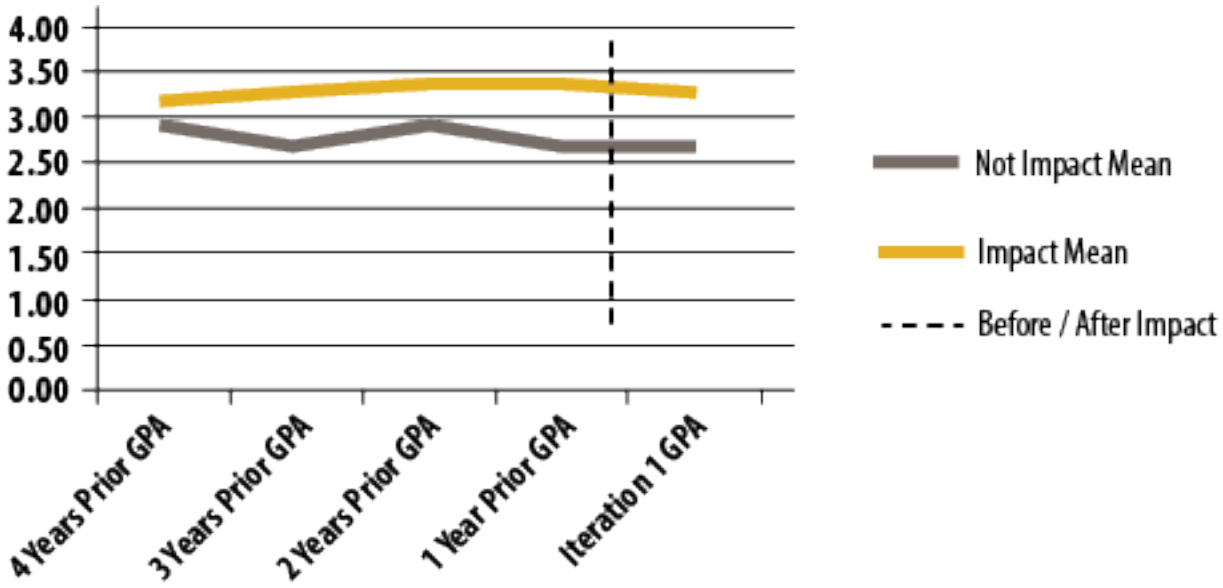


Figure 20. GPA for IMPACT/Non-IMPACT courses by year for Fall 2013 Cohort

IMPACT on 1-year, 2-year, and 3- year student retention

Overall, when examining all cohorts at the aggregate level, there is no significant difference in retention to the university. However, increases in student retention were observed for specific IMPACT courses in Fall 2011, Spring 2012, Fall 2012, and Spring 2013. Specifically, we note increases in retention in courses in the college of Sciences, Technology, Engineering, Health and Human Sciences, Agriculture, and Liberal Arts. The most positive results are obtained for the courses in the Spring 2013 cohort, where an overall increase in 1-year retention was observed. In the majority of these courses, the increase was at least 2%.

It is important to note that for the Fall 2012 and Spring 2013 cohorts, only one year of data following the implementation of the redesign is available for comparisons. More data is needed to establish robust trends.

FUTURE ANALYSES

In light of IMPACT's overarching goal to work with faculty to create student-centered learning environments, and the positive influence of a student-centered learning environment on student outcomes including performance, future work could examine the effect of redesigns on DFW rates, course GPA, and retention to the university, as a function of student-centeredness. More specifically, courses that are being categorized as high student-centered would be tracked separately from courses that are categorized as low student-centered. We hypothesize that greater effects on DFW rates, course GPA, and retention to the university would be observed for high student-centered courses.

In addition, more work needs to be done in order to identify what factors or redesign elements are linked or more closely associated with the creation of a student-centered learning environment.

Finally, additional constructs, which are part of self-determination theory (consult Part I of the report for more information), are currently being explored to more fully understand the effect of the IMPACT program on student learning and success. In future reports, student motivation data will be analyzed, interpreted, and integrated in the report.